ST SulTRAC

May 17, 2017

Ms. Shari Kolak
Work Assignment Manager
U.S. Environmental Protection Agency (EPA)
77 W. Jackson Blvd.
Chicago, Illinois 60604

Subject: **Responses to Comments/Proposed Revisions**
Draft Focused Feasibility Study (FFS) Report (Revision 0)
East Troy Contaminated Aquifer (ETCA) Site
Troy, Miami County, Ohio
Remedial Action Contract (RAC) 2 No. EP-S5-06-02
Work Assignment No. 145-RICO-B5EN

Dear Ms. Kolak:

SulTRAC is providing the enclosed responses to Ohio Environmental Protection Agency (Ohio EPA) review comments dated March 17, 2017, on the above-referenced draft FFS report. The comments were provided via e-mail from Madelyn Adams, the Ohio EPA Site Coordinator.

Ohio EPA's comments were discussed during a teleconference with the U.S. Environmental Protection Agency (EPA), Ohio EPA, and SulTRAC on April 3, 2017. Proposed revisions to the draft FFS were also discussed during EPA's Alternatives Array (AA) review completed on April 5, 2017, in which SulTRAC and Ohio EPA also participated. The scope of the interim action (IA) and proposed revisions to the draft FFS were also discussed during several conference calls between EPA and SulTRAC in April 2017.

The objectives of SulTRAC's detailed responses are to (1) provide information and clarification requested in Ohio EPA's March 17 comment letter and (2) describe the proposed revisions to the draft FFS to address Ohio EPA's comments. SulTRAC's responses also address additional issues that were discussed during the conference calls and the AA review.

The proposed revisions are presented in the enclosure. Proposed revisions not specifically requested in Ohio EPA's comments (but agreed upon during discussions with EPA) are presented first, followed by responses to Ohio EPA's March 17 comment letter. Each original Ohio EPA comment is presented in its entirety in *italic* font, followed by the response in regular font.

If you have any questions regarding this draft report, please call me at (513) 333-3669.

Sincerely,

Guy D. Montfort

Guy Montfort
SulTRAC Project Manager

Enclosure

cc: Daniel Olsson, EPA Contracting Officer (letter only)
Melinda Gould, SulTRAC Contract Manager (letter only)
Madelyn Adams, Ohio EPA Site Coordinator (Southwest District Office)
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SUMMARY OF PROPOSED REVISIONS/RESPONSES TO OHIO EPA COMMENTS ON SulTRAC's JANUARY 2017 DRAFT FOCUSED FEASIBILITY STUDY (FFS) REPORT EAST TROY CONTAMINATED AQUIFER SITE TROY, MIAMI COUNTY OHIO

The proposed revisions and responses to comments on the draft East Troy Contaminated Aquifer Focused Feasibility Study (FFS) (1) provide information and clarification requested in Ohio EPA's March 17 comment letter, (2) present proposed revisions to the draft FFS that will address Ohio EPA's comments, and (3) address additional issues that were discussed in teleconferences between EPA, Ohio EPA, and SulTRAC.

Proposed revisions not specifically requested in Ohio EPA's March 17, 2017, comment letter (but determined through other discussions) are presented first, followed by responses to the March 17, 2017, comment letter.

Additional Issue 1 – Proposed Alternatives for Soil. The January 2017 draft FFS originally carried two alternatives for soil in Exposure Areas (EA)-1 and EA-6 through the detailed and comparative analyses. These alternatives were (1) No Action and (2) Excavation with Off-Site Disposal. Based on discussions with EPA subsequent to the April 5, 2017, Alternatives Array (AA) review, EPA has decided to add a third alternative for soil that will be carried through the detailed and comparative analyses. The third alternative will include the following components:

- Excavation and off-site disposal of soil in EA-1
- Capping with institutional controls in EA-6

It is assumed the type and cost of the cap needed for EA-6 will comply with all applicable Ohio EPA requirements for asphalt caps.

Additional Issue 2 - Institutional Controls (IC) for Groundwater and Soil Vapor. Based on discussions during the AA review and subsequent follow-up conference calls with EPA, ICs will be removed from the groundwater and vapor intrusion (VI) alternatives. The text in the FFS will be revised to remove all references to ICs associated with these alternatives. It should be noted that Ohio EPA's comments also included requests for clarification on how these ICs would be implemented and are thus no longer relevant; however, additional clarification is provided in the responses below.

Additional Issue 3 – Remedial Action Objectives (RAO) for Groundwater. Based on input from the EPA Regional Superfund Branch Chief during the AA review, the titles of the groundwater RAOs will be revised to remove the reference to 90 percent reduction in tetrachloroethene (PCE) mass. A 90 percent reduction in PCE mass will remain as the targeted goal from which the assumptions in the FFS are based, and will be discussed in the text, but the ~~specific numerical goal will be removed from the actual RAO titles.~~

RESPONSES TO OHIO EPA COMMENTS

The original Ohio EPA comment is presented in its entirety in ***italic*** font, followed by the SulTRAC response in **regular** font. Where noted, the exact wording of the proposed revision is presented in the response.

General Comments

1) *In the following comments, Ohio EPA outlines numerous concerns regarding the selection of a ground water remedy without an initial pilot study. Due to unknowns regarding the geology of the aquifer, it is unclear if the most favorable remedy, In-Situ Chemical Oxidation (ISCO), will be effective. Therefore, Ohio EPA requests that a pilot study be conducted now during the FFS to determine specific aquifer parameters, such as hydraulic conductivity and natural oxidant demand (NOD), and to determine if ISCO will be effective in the target zones. As a part of the FFS, contingent remedies should be specified if the pilot study for the proposed remedy does not work as expected.*

   If U.S. EPA is unable to conduct a pilot study before a Record of Decision (ROD) is written, Ohio EPA requests that contingencies be written into the ROD to allow for alternate remedies if the pilot study indicates that the chosen remedy will not be effective.

   RESPONSE: The draft FFS includes three potential in-situ technologies: in-situ chemical oxidation (ISCO), in-situ chemical reduction (ISCR), and enhanced reductive dechlorination (ERD), which are each carried through the detailed analysis and comparative analysis of alternatives. While ISCO currently appears to be the preferable approach for in-situ treatment, two additional technologies (ISCR and ERD) are presented and evaluated in the FFS and could be selected. As discussed during the April 3 conference call between SulTRAC, EPA, and Ohio EPA, and in the April 5 AA review, EPA's intent is to proceed with a ROD and conduct additional testing as part of the remedial design (RD). Pilot studies, if needed, will be completed after other key data (for example, NOD) are collected and possible bench-scale testing is completed because these test results may determine which of the three technologies will be implemented. Should pre-design testing indicate that conditions are not favorable to ISCO, either ISCR or ERD would then be implemented.

   Additional data are needed to support the RD at the locations where injections, extraction, and treatment may occur; however, the aquifer materials in the proposed treatment areas are relatively well characterized. SulTRAC's ETCA site RI report (SulTRAC 2015) included the installation of 189 borings (29 monitoring wells; 38 membrane interface probe (MIP)/ vertical aquifer profiling borings, 37 Waterloo vertical aquifer profile borings, and 85 additional soil borings) to collect soil and groundwater samples for characterization and to conduct chemical, geophysical, and geotechnical analyses. These data were integrated with existing data from numerous other borings, wells, pump tests, and studies completed by the City of Troy, Ohio EPA, and others over the past 20 years of investigations at the site.

   RI data collected from proposed Treatment Zone A included data from seven Waterloo profile borings (vertical groundwater contaminant profile, specific conductance, dissolved oxygen (DO) oxidation-reduction potential (ORP), pH, and relative hydraulic conductivity (IK). In addition, seven MIP vertical profile borings, 13 Geoprobe borings, and a hollow-stem auger geotechnical boring were installed. Three new sonic borings/monitoring wells were also installed and sampled. At each boring location, multiple lines of data were collected. Data collected included lithologic characteristics, contaminant concentrations, IK, electrical conductance, and geotechnical properties of the subsurface materials.

The aquifer is predominantly sand and gravel. Discontinuous clay layers and some silty or clayey sand and gravel lenses were observed throughout the study area, with those of significant thickness only being observed downgradient/east of Clay Street. Based on observed lithology at monitoring well (MW)-EPA-107I, geologic conditions may potentially exhibit some variation in fines (silt and clay) content, both laterally and vertically. However, in the area along the west side of Walnut Street, closest to the suspected source, the Waterloo vertical profiles of IK indicated relatively consistent values over all vertical profiles and did not indicate the presence of significant zones that would impede remediation.

The data gathered to date will be used to determine what additional data is needed; more detailed information will be gathered at the proposed injection sites as part of the RD. This data may impact the technology ultimately selected as well as the design parameters for that technology. The exact data needs and approach will be determined during the RD and may include (but not necessarily be limited to) adding new borings, collecting additional lithologic and contaminant data, NOD studies, hydraulic conductivity/ seepage studies, and bench- and pilot-scale evaluations.

2) *The cost share process for interim actions is unclear. Please provide clarification on the following:*

a. During the December 2016 conference call with Ohio EPA and U.S. EPA, U.S. EPA indicated that the remedial action cost share requirements apply to the interim actions. Therefore, Ohio EPA is required to pay 10% of the remedy installation and 100% of operation and maintenance (O&M). It will be necessary to have a Superfund State Contract (SSC) or a Cooperative Agreement (CA). Please provide clarification on when this process will be initiated and the steps it will require.

b. The cost estimate for the interim ground water remedy specifies O&M activities starting in year one with the first injection of ISCO. Does U.S. EPA consider the ground water interim action to be a ground water restoration remedy with a 10-year long term response action (LTRA) period, or a source control maintenance/containment remedy without a 10-year LTRA period?

c. U.S. EPA guidance states that the LTRA period starts and/or O&M is transferred to the state after the remedy is "operational and functional." For the proposed injection schedule at ETCA, when will the remedy be considered operational and functional?

d. U.S. EPA is proposing to install sub-slab depressurization systems (SSDS) at occupied structures over the ground water injection zones and possibly institutional controls. A 30-year O&M schedule has been outlined in the cost estimate. Does the LTRA period apply to the SSDS and institutional controls? When does U.S. EPA consider the SSDS and institutional controls to be operational and functional?

RESPONSE: Cost sharing is not discussed in the FFS; however, during the April 3 teleconference and April 5 AA review, EPA discussed Ohio EPA's comments and questions regarding cost sharing and provided clarification. If further questions or comments regarding cost sharing arise, they will be addressed through direct discussion between EPA and Ohio EPA. Assumptions regarding duration of the interim action (IA) and the use of ICs will be revised, as discussed during the April 3 teleconference between

SulTRAC, EPA, and Ohio EPA, and the April 5 AA review. Specifically, the ICs for groundwater and VI will be removed, the presumed duration of O&M for the SSDS will be revised from 30 years to 15 years, and the cost estimates will be revised accordingly.

Pathway-Specific Comments – Ground Water

3) *Uncertainties in aquifer geology: Section 1.2.2, page 14, discusses what is known about the site geology. Please evaluate how the depth of the contamination and the geology in the Residential Plume would impact the use and effectiveness of in-situ treatment, and other proposed remedies.*

RESPONSE: The text in Section 1.2.2 will be revised to clarify site geology. The site geology is relatively well characterized and the aquifer in the proposed treatment area is comprised of predominantly coarse (sand and gravel) materials; however, due to the potential for lateral and vertical variability with regard to fines (primarily silt) content, additional data will be gathered in the primary suspected source area and specifically at the proposed injection sites as part of the RD.

The data collected to date indicate that at least one of the three proposed technologies (ISCO, ISCR, or ERD) will be effective in reducing PCE concentrations at the site. The cost estimates in the FFS assumed treatment to a depth of 100 feet below ground surface (bgs) based on data from the Walnut Street area, and also assumed that treatment/ injections will occur at multiple horizons. For estimating purposes, three horizons were selected because the Waterloo profile data suggested relatively consistent hydraulic conductivity at least to depths of 85 feet in the Walnut Street area. Visual geologic characterization data from the boring for MW-EPA-107I suggested that some finer grained zones (i.e. mostly silty sand and gravel mixtures rather than clay) may be present between 35 and 60 feet and thus lithology may vary laterally and vertically; however, based on comparison with the nearby Waterloo data, these variations may or may not impact hydraulic conductivity in the source area. Based on these observations, estimates of the exact numbers, locations, and depths of injection wells will be refined through additional data collected during the RD. If found at the proposed injection sites, the presence of zones of limited hydraulic conductivity will be considered in the RD and may require additional injection depths or other design considerations.

The highest contaminant concentrations detected were found in a relatively narrow area near the west curb of Walnut Street, at depths between about 35 and 60 feet bgs. While several thin clay layers (37 to 40 feet, 44.5 to 45 feet, and 51.5 to 52 feet) were observed in the boring for MW-EPA-107I and some finer grained material (mostly silt) was noted mixed with sand and gravel layers at this particular location, the aquifer materials are predominantly sand and gravel. The highest concentrations of PCE (3,560 ppb in Waterloo Boring WL-5 and 2,200 ppb in MW-EPA-107I) were found between about 40 and 52 feet bgs. At MW-EPA-107I, this horizon is a 4.5-foot thick layer of mixed silt/sand and gravel (about 44 percent fines) overlying relatively coarse, orange-brown stained sand and gravel with a solvent odor (about 7 percent fines). MW-EPA-107I is actually screened in this coarser, orange-stained layer. The observation of fine grained materials at MW-EPA-107I does not appear to correlate with the continuous IK data collected at each of the Waterloo borings on the west side of Walnut Street, and to the east of MW-EPA-107I in the police station parking lot, which indicated that hydraulic conductivity does not vary significantly throughout the proposed treatment interval. The line of Waterloo borings down the west side of Walnut Street (WL-04, WL-05, WL-03, WL-03A, and WL-02) are the closest data to the suspected source, which appears to have been in the area between the current southeast portion of the 2001 church addition andand the Walnut Street sanitary sewer. The MW-107 well cluster is approximately 75 feet further downgradient. The IK logs for each of the Waterloo borings on Walnut Street indicated no significant variations in hydraulic conductivity over their entire depths, which were logged to a maximum depth of 85 feet bgs.

More detailed information on the hydrostratigraphy in the proposed treatment areas will be gathered at the proposed injection sites as part of the RD. This information may include collecting lithologic data, conducting NOD studies, performing hydraulic conductivity/seepage studies, and collecting other necessary data to support the RD. The exact data needs and methods to be used to gather that data will be determined as part of the pre-design studies.

4) *As a part of the FFS, hydraulic conductivity should be measured or more specific information should be provided for hydraulic conductivity. Section 1.2.3, Site Hydrogeology, page 15, states that literature estimates for hydraulic conductivity of the aquifer vary (0.25-2.5 feet per day) and the Remedial Investigation (RI) provides a range of values. It is Ohio EPA's position that hydraulic conductivity should be measured before a ROD is written.*

   It is important to understand the hydraulic conductivity and to directly measure it. Specifically, hydraulic conductivity is a parameter that is used to calculate the ground water flow velocity. Ground water flow velocity will influence the predicted transport distance of the injected oxidant, which influences the amount of oxidant needed for successful distribution to the source material. Because of the wide range in literature values, the use of an estimated hydraulic conductivity may over/under estimate the effectiveness of an in-situ remedy and the amount of oxidant needed. The remedy may not be able to achieve the 90% reduction Remedial Action Objective (RAO) and the cost estimate may be inaccurate.

   RESPONSE: (The text referred to in Section 1.2.3 appears on Page 17). Additional hydraulic conductivity/seepage data will be gathered to support the RD at the specific injection areas/depths; results may impact which of the three proposed technologies will best suit the objectives of the interim action (IA). In addition, the values cited in the comment, which vary by an order of magnitude (0.25 to 2.5 feet/day) are not hydraulic conductivity (K) values but rather are the range of values for estimated groundwater flow velocity (v). Velocities are influenced by porosity, and spatial and temporal variations in gradient, as well as K. The hydraulic conductivity values, as reported in the RI report, were in the range of 100 to 200 feet per day in the upper portion of the aquifer and 75.7 to 140 feet per day in the lower portion of the aquifer and thus vary by a factor of approximately 2 within each zone, rather than an order of magnitude. Although determined by other entities prior to the RI, the hydraulic conductivity estimates presented in the RI were based on multiple sources and are actual site-specific values determined by aquifer response (pumping) tests completed at locations within the site, rather than from literature values or slug test values, and should provide reasonable confidence in the general range of hydraulic conductivity values on a site-wide scale. The zone referred to as the "middle zone" – a discontinuous zone of glacial till and/or lacustrine clay that separates the upper and lower aquifers in some areas of the site – exhibits very low hydraulic conductivity, where present in significant thicknesses. However, at the MW-EPA-107I location, only a few thin clay layers and some silts and minor clays intermixed with the sand and gravel were observed, and the Waterloo IK data suggest relatively consistent hydraulic conductivity both laterally and vertically in the area along Walnut Street. Thus the potential for significant variations in hydraulic conductivity within the treatment areas will be evaluated during the RD.

5) *RAOs for the Residential Plume: Section 2.1.2, page 43, states that the RAO's are proposed to reduce dissolved phase mass. However, Section 1.1.1 states that dense non-aqueous phase liquid (DNAPL) and sorbed tetrachloroethene (PCE) may be present and are acting as ongoing sources of contamination.*

   a. Please provide additional information that supports the proposed in-situ remedies will also work to reduce the DNAPL and sorbed mass, as well as the dissolved phase contamination. For example, the highest PCE concentrations found just downgradient of the source area were at depths (~45 feet) that coincided with clay, clayey gravel and clayey sand. ISCO has slow rates of diffusion into low permeability zones and tends to have preferential flow through more transmissive zones. Considering this, Ohio EPA is concerned that the highest zones of contamination may not be addressed by ISCO.

   RESPONSE: The RD will address zones of varying permeability or higher contaminant concentrations, as needed. Additional data will be gathered during the RD to confirm hydrostratigraphy and design considerations at specific locations where injections are planned. Text in Section 1.1.1 will be revised to clarify that the presence of DNAPL in the area is a conservative assumption; however, DNAPL has not been observed at the locations sampled to date. In addition text in Sections 1.2.2 and 1.2.3 will be revised to clarify the hydrostratigraphy in the Walnut Street area.

   Additional information will be provided in Sections 1.2.2 and 1.2.3 to clarify what is known about geology/hydrostratigraphy in the proposed treatment areas. Although several thin clay layers were observed at MW-EPA-107I, the aquifer materials are predominantly sand and gravel with varying amounts of silt. Detailed review of the original field logs and core photographs from the sonic boring for MW-EPA-107I, as well as data from the adjacent boring, GT-WAL-303, confirm the following vertical sequence for materials in the saturated zone at the MW-EPA-EPA-107I location:

   - Fine to coarse sand and gravel to 35 feet
   - Clayey sand 35 to 38 feet
   - Dense gray clay 38 to 40 feet (a sample of this clay was collected and analyzed for VOCs, found to be clean, and did not appear saturated)
   - Silty gravel and sand 40 to 44.5 feet (56 percent sand and gravel; 44 percent fines, minor amount clayey sand)
   - Dense clay 44.5 to 45 feet
   - Orange-brown-stained sand and gravel 45 to 50 feet (92 percent sand and gravel, <8 percent fines)
   - Sand and gravel with some clayey/silty sand below 50 feet

   MW-EPA-107I (PCE 2,200 µg/L) is screened from 47 to 52 feet bgs, primarily in the orange-brown stained sand and gravel. Across Walnut Street (approximately 80 feet upgradient) at Waterloo Boring WL-05, the highest PCE concentration (3,560 µg/L) was found at 44 feet bgs but significant PCE concentrations were present throughout much of the saturated thickness. The IK data from WL-05, as well as from the other Waterloo borings on the Walnut Street transect, indicated no significant variations in hydraulic conductivity over their entire depths.

Based on these observations, it is unclear if the silty zone observed at MW-EPA-107I from 40 to 44.5 feet, or the silty/clayey sand observed below 50 feet, are present on the west side of Walnut Street, or if present, whether they would impact hydraulic conductivity. For these reasons, additional borings and evaluations will be completed to support the RD by providing data at the locations specifically proposed for injections and extraction. During the RD, variations in permeability will be considered.

The text in Section 1.1.1 will be revised to clarify that the presence of DNAPL in the area is a conservative assumption; however DNAPL has not been observed at the locations sampled to date. A potential DNAPL source in the area was assumed because the maximum concentration of PCE observed in dissolved-phase groundwater samples (3,560 µg/L) is greater than 1 percent of the solubility of PCE in water (150,000 µg/L). EPA and various other sources indicate a conservative "rule of thumb" that assumes dissolved-phase concentrations greater than 1 percent (although some sources say 10 percent) of the solubility suggest that DNAPL may be present. However, DNAPL was not observed in groundwater samples or purge water from monitoring wells at the site and immiscible phases were not detected in any of the monitoring wells when checked with a multiphase-probe during the RI. Furthermore, the maximum detected PCE concentrations in any samples were still substantially lower than the solubility of PCE in water. For these reasons, the presence of DNAPL has not been confirmed. Additional data will be gathered during the RD and zones of significantly higher contaminant concentrations or DNAPL will be addressed in the RD.

b. Before a remedy can be selected, it is necessary to have a sound basis for the remediation time frames and their ability to achieve the RAOs. Sections 6.3.2.1, page 118, 6.3.2.5, page 121, 6.3.3.1, page 123, 6.3.3.5, page 125, 6.3.4.1, page 127, 6.3.4.5, page 130 and Appendices B and C discuss the various injection technologies and state that they will be able to reduce the mass of contamination to 90% in 10-15 years. An explanation for how the proposed injection technologies will achieve a 90% reduction in mass has not been provided. Additionally, the FFS is missing an explanation for how the proposed injection technologies will achieve RAOs within 10-15 years. Please provide a rational for the 90% reduction and provide a basis (i.e., modeling) for the remediation timeframes.

RESPONSE: Remedial duration estimates were based on reasonable estimated degradation half-lives. Additional information will be added to Appendix C to provide the rationale for 90 percent mass reduction and estimated remedial durations. A 90 percent decrease in mass corresponds to a reduction by a factor of 10. If treatment decreases concentrations by 50 percent each year, a 90 percent decrease in any given zone could be achieved in less than 4 years. That is, an apparent degradation half-life (inclusive of desorption) of 1 year would achieve 90 percent reduction in less than 4 years. In general, this is reasonable for active remediation of PCE and daughter products. ISCR/ERD achieved 90 percent mass reduction within targeted treatment areas in 3 years at the Copley Square Superfund Site in Ohio. Similarly, ISCR/ERD achieved more than 90 percent mass reduction within targeted treatment areas in 2 years at the Grand Traverse Overall Supply Superfund Site in Michigan. Remediation at the ETCA site is expected to proceed more slowly because of access limitations and the related inability to inject directly into some of the contaminated zones.

6) *Appendix B, Residential Area Plume Dissolved-Phase Mass Calculations: From the tables provided, it is not clear how total mass and the percentage reductions were calculated. Therefore:*

a. Please revise the first table with headers and gridlines because it is not clear what each number represents.
b. Please describe the relationship between the two tables.
c. Please describe why the porosity value is different between the two tables and provide the reasoning for the chosen value.

RESPONSE: The first table will be revised as requested. The first table establishes plume geometry and calculates plume thickness, which is used in the second table. The other elements of the first table are not relevant to mass calculation and will be removed. The first table uses porosity (0.3) to calculate total pore volume, which is not used in the mass calculation. The second table uses effective porosity (0.2) for the mass calculation because only interconnect pore space would be amenable to treatment. The table on Page 3-21 of the RI report (SulTRAC 2015) indicates porosity ranges from 0.18 to 0.4. Therefore, a total porosity of 0.3 was used. The effective porosity value used (0.2) was an estimate based on total porosity.

7) *Ground Water Institutional Controls:*

a. Section 4.2.2 Institutional Controls, page 74, discusses that the potable use pathway for ground water is currently restricted by the city-wide ordinance. However, this may not be accurate. According to the text, the current city ordinance restricts the connection of a private water supply well to household systems. It appears that a ground water well could still be installed and/or utilized (though the City would not allow the well to be hooked up to their sanitary sewer). This would not preclude a property owner from having a potable supply well and not hooking it up to the sanitary sewer.

b. Sections 4.2.2 Institutional Controls, page 74 and 5.2.2 and 5.2.3, pages 96 and 98, respectively, discuss expanding the City of Troy's ground water well ordinance to include non-potable ground water use restrictions. Please provide more details regarding the proposed use of the governmental controls for ground water use restrictions. How would such a restriction be implemented and maintained?

RESPONSE: ~~Based on the apparently low likelihood of use of private potable wells in the plume/ treatment area, EPA has determined that~~ institutional controls beyond those already in place through the City of Troy ordinances will not be **included as part of the IA;** therefore, the FFS will be revised to remove institutional controls as components of the groundwater alternatives. Groundwater will be monitored during and after the IA to ensure that groundwater treatment does not exacerbate the problem by increasing contaminant mobility or by inducing migration of contaminants to areas outside of the plume boundaries.

The City of Troy ordinances currently (1) prohibit connection of a potable use well to a house served by the municipal water supply system and (2) require all new construction within the city limits to be connected to the municipal system. Based on these considerations, only existing houses that are not connected to the city system could legally use a private, potable supply well. SulTRAC has identified no such private domestic supply/potable wells within the plume boundaries. According to the City of Troy, one residence located at [redacted], which is outside of the plume area, currently uses a private supply well. Also, ODNR's website indicates one well log for a 1950s-era well located at [redacted]; however, the current status of this well is unknown. Both of these locations are north of East Main Street and east of the Franklin/East Main area, lateral to and outside of the plume boundaries. In addition, the City of Troy recently tested the well at [redacted] for VOCs and results were nondetect.

During the RI, one unused yard/irrigation (non-potable) well was confirmed near Union and Main Streets, and several other such yard/irrigation wells may be present just outside the plume boundaries (based on ODNR's water well log database); however, the Human Health Risk Assessment (HHRA) appended to the RI estimated the risk from using water from such wells for non-potable purposes, and found it to be negligible.

8) *Section 4.2.8, page 82, states that treated ground water be may discharged to injection wells, surface water, or to a publicly owned treatment works (POTW). All three of these discharge options will require some regulatory review: Underground Injection Control program (UIC) approval, a National Pollutant Discharge Elimination System (NPDES) permit, or pretreatment approval through the local POTW system.*

RESPONSE: The text on Page 82 will be revised to state: "All three of these discharge options will require some regulatory review or approval: Underground Injection Control program (UIC) approval, a National Pollutant Discharge Elimination System (NPDES) permit, or pretreatment approval through the local POTW system."

9) *For all injection technologies, please be aware that Ohio EPA's UIC program will have to approve the injection plan.*

RESPONSE: All applicable sections of text within the FFS will be revised to reflect that injection plans will require Ohio EPA's UIC program approval.

10) *Performance monitoring-well system: Justification should be provided regarding the location of the performance monitoring wells located on Figure 5-3. No information regarding location or cost was provided in the text. Additionally, if an in-situ remedy is ultimately chosen, Ohio EPA requests that additional monitoring wells be installed to monitor the areas of highest concentrations and the plume boundaries to ensure that plume migration is not occurring. This is essential not only to monitor ground water but also for evaluating potential vapor intrusion impacts beyond the preemptive mitigation area.*

More specifically, additional monitoring wells should be installed in Zone A in the source area at varying depths to monitor the areas of highest concentrations during and after injections. Monitoring wells should also be installed along the plume boundaries in Zone A (and other zones) to ensure that concentrations above the maximum contaminant level (MCL) are not migrating into clean ground water. These additional locations could be proposed after remedy selection is finalized.

RESPONSE: The locations and numbers of wells indicated on Figure 5-3 are intended to show the general locations and numbers of wells on which the assumptions for the approximate costs in the FFS were based and should not be considered as the "design" locations. It is acknowledged that more wells may be required in some areas. The exact numbers, locations, and depths of all performance monitoring wells cannot be determined until the RD is completed and will be influenced by the actual injection locations and depths as well as by potential receptors. In addition, it may be necessary to add wells to the network as the IA progresses and performance data becomes available. Statements clarifying this will be added to appropriate portions of the text and to Figure 5-3.

11) *For all in-situ remedies, Appendix C states that ground water monitoring would continue until remediation goals are achieved. Ground water monitoring should not be discontinued*

at this time, because while ground water contamination may have been reduced, ground water MCLs will not have been reached. Ground water monitoring may need to be optimized, depending on the final remedy, but should not be discontinued.

RESPONSE: Long-term groundwater monitoring is expected to continue after the interim measure is complete. Groundwater monitoring following completion of the interim measure is beyond the scope of the FFS and will be addressed in the permanent FS and ROD for this site. .

12) *Appendix C states that injection wells would be nested and screened at three different depths over the vertical interval. Please provide the proposed depths and a rationale for the depths.*

RESPONSE: Multiple screen intervals would be necessary to minimize preferential flow through more permeable strata. However, location-specific screen intervals have not been determined because they would vary by location and require a level of effort typically associated during the RD. Additional location-specific data will be gathered to support the RD. The cost estimates assumed treatment of up to 80 feet of saturated thickness and to depths up to 100 feet, with three discrete transmissive intervals on average, and therefore three screen intervals were ysed to develop alternative cost estimates. The exact locations and depths will be determined as part of the RD and the depths may vary from location to location, given the nature of the geology and contaminants. A statement clarifying this will be added to Appendix C.

13) *Appendix C, Table C-2-3A indicates the same annual costs for oxidant injection during years 2 through 7. However, according to the table on page C-2-6, the amount of injection (numbers of zones) varies considerably during those years. Why does the annual cost stay the same whether 1 or 4 areas are being injected? Please revisit this estimation.*

RESPONSE: The cost of oxidant was assumed to be a capital cost. Periodic costs do not include the cost of oxidant. Periodic costs include groundwater monitoring (Items 38 through 45) and O&M costs (Items 46 through 50) shown on Table C-2-3. An average O&M cost was used for all years.

<u>Technology-Specific Comments - Air Sparging/SVE</u>

14) *Air sparging and soil vapor extraction (SVE): Section 4.2.5.5, page 80, provides an overview of air sparging/SVE for the interim ground water remedy. Air sparging/SVE is not retained for further consideration because of uncertainties in the lateral extent of clayey soils and logistical concerns with construction of an SVE system. However, Ohio EPA recommends that air sparging/SVE be more thoroughly evaluated, including the use of horizontal wells. Considering the limitations of chemical injections, air sparging/SVE may be a more appropriate remedy for an interim action, especially in the source area as it may be more successful in reducing the DNAPL and sorbed mass. Recently, Ohio EPA has seen success with this technology at the EPS site in downtown Dayton, Ohio. This technology has also been pilot tested at the Behr superfund site (also in downtown Dayton). Both sites have a similar geologic setting and are dealing with the same chemicals of concern (COCs) and spatial constraints in a populated, neighborhood setting. Additionally, the proposed interim ground water remedy, ISCO, has logistical and technical concerns that are similar to SVE/air sparging. Though the depth of contamination may limit this technology, Ohio EPA requests that the FFS include a more robust evaluation, discussion, and consideration of air sparging/SVE.*

RESPONSE: The discussion of sparging in Section 4.2.5.5 will be expanded to reflect that the limited potential radius of influence of air sparging, given the physical and logistical access constraints in the Walnut Street source area, is the primary constraint in using this technology. SulTRAC has reviewed the information provided by Ohio EPA regarding the EPS site and has also reviewed EPA Superfund Branch information regarding the Behr site. The ETCA site presents physical constraints with regard to access and site setting, as well as other factors, that differentiate it from these other sites. The current assumption is that treatment beneath the footprint of the church addition structure, which is inaccessible, will be required and that the chosen technology will have to be implemented from locations outside of the present building footprint. Available information indicates that much of the former dry cleaner location lies at a distance beyond the typical effective radius of sparging wells (which is about 15 feet). Due to this consideration, vertical sparging wells would not likely be capable of treating the area. Horizontal drilling/wells would be technically and administratively challenging, possibly infeasible, due to the presence of utilities and numerous private properties that would have to be crossed. In addition, the vertical thickness of the zone requiring treatment (assumed to be at least 75 to 80 feet) also renders horizontal wells much less practical for treatment.

The text of Section 4.2.5.5 will be revised to provide the additional information regarding the rationale for screening out air sparging and will read as follows: "Current uncertainties regarding the presence of residual source material beneath the present church addition structure necessitate an assumption that, unless data collected during the RD can confirm otherwise, treatment beneath the structure will be required. Due to the limited radius of influence for sparging wells (typically about 15 feet), the difficulties associated with horizontal drilling in the source area, and the saturated thickness of the zone requiring treatment, air sparging is not retained for further consideration."

15) *Ohio EPA requests that consideration be given to the use of ozone sparging as a remedial technology for the Residential Plume. Ozone sparging has been successful at another site in the southwest district with similar geology and COCs. Ozone sparging is similar to air sparging, though it does not require SVE as the ozone acts as an oxidant similar to ISCO oxidants and completely oxidizes chlorinated volatile organic compounds (VOC) in the aquifer. The same aquifer parameters are needed for the proposed in-situ technologies and the system would be set up similarly.*

RESPONSE: Ozone sparging is a type of ISCO, and while it is a proven remediation technology for the contaminants of concern, it is not included in the FFS for this site for the reasons listed below.

- Vertical sparge wells could not be installed in some areas where they would be needed. Ozone degrades rapidly and does not persist in groundwater. Consequently, advective transport is not a significant mechanism for ozone delivery to targeted treatment zones. This means that treatment zones could only be targeted by direct injection into those zones. (Sparge wells would have to be distributed within the footprint of treatment zones.) However, this would not be possible because large portions of targeted treatment zones are covered by structures. Those portions would then either have to go untreated, or be targeted via horizontal wells.
- Ozone sparging via horizontal wells is not a proven technique, and may not be effective. It would be challenging to ensure adequate gas flow through the entire

length of horizontal well screens. More gas would flow through proximal portions of the screens than through distal portions.

- Vapor intrusion of ozone could pose acute health risks to residents because ozone has a an immediate danger to life and health (IDLH) concentration of only 5 ppmV and an exposure limit of only 0.1 ppmV. Controls to safeguard against ozone vapor intrusion may not be cost-effective.

Unlike ozone, persistent oxidants offer the benefit of access to areas below buildings through groundwater advective transport. That is, an oxidant like permanganate injected upgradient of a building would migrate with groundwater toward and underneath the building; however, ozone would not.

Technology-Specific Comments – ISCO

16) *Considering sections 4.2.5.3, page 79, 5.2.4, page 99, and 6.3.3, page 123, please discuss the following concerns regarding the proposed ISCO remedy:*

a. *Achieving effective contact between reagents and contaminants can be challenging, potentially leading to rebound. At sites in Ohio, and more specifically in the southwest district, rebound has commonly been seen with the use of ISCO. Additionally, immediately after injections, concentrations have significantly increased and remained elevated (perhaps because of mobilization or redistribution of contaminants). Please provide a brief discussion regarding how the proposed remedy and injection schedule will address any rebound that may occur.*

   RESPONSE: (Note: cited Section 6.3.3, Page 123, discusses ISCR). The text in Section 5.2.4 will be revised to include the following discussion of rebound concerns. "Rebound occurs when treatment terminates before significant depletion of non-aqueous contaminant mass (sorbed and NAPL). To prevent rebound, remedies must focus on the area or areas containing most of the contaminant mass, and ensure adequate contact between contaminants and the remediation chemical. If ISCO is selected, it would achieve this through ongoing, gradual injection of oxidant such that relatively constant oxidant concentrations are maintained within targeted treatment zones for several years. Injection wells would be designed to avoid preferential flow and facilitate vertical distribution of the oxidant. Contaminant concentrations will invariably increase when treatment stops, and if the rebound concentrations exceed treatment objectives, injection would resume."

b. *Ohio EPA has seen displacement of dissolved phase COCs in transmissive zones by injected solutions, causing migration or redistribution of the plume. For ISCO, there are multiple injection events proposed over the course of 7 years. Please describe how the spreading of the plume will be controlled and monitored.*

   RESPONSE: The text will be modified to explain that the existing site monitoring well network will be supplemented with additional wells at appropriate locations and depths to monitor the performance of the technology to meet RAOs. Potential concerns, such as spreading of the plume, generation of daughter products, or other technology-specific issues such as potentially solubilizing metals will also be discussed. In addition, the oxidant would be injected at low flow rates. There would not be discrete injection events displacing large pore volumes of groundwater. The network of performance monitoring wells would detect plume spreading if it occurs. Furthermore, treatment will commence in Zone A and proceed to areas further downgradient gradually after data from Zone A indicates that the technology is beginning to be effective and operating parameters can be optimized. This will allow adjustment of any operating parameters as needed to minimize risks of spreading high concentrations of VOCs to areas that are currently clean or have significantly lower VOC concentrations..

c. *Injection depths are proposed to 100 feet west of Clay Street (Zones A and B) and 60 feet east of Clay Street (Zones C and D). Ground water monitoring should be conducted to the depths of the injections at the downgradient end of Zone B to ensure that contamination is not being moved deeper through Zones C and D.*

RESPONSE: The text will be modified to explain that the site monitoring well network will be supplemented with additional monitoring wells at appropriate locations and horizons to monitor performance of the technology and to ensure that contaminant migration is not exacerbated by the treatment technology. The monitoring system design will depend on the technology and selected injection depths. For these reasons, some additional monitoring wells may be installed to support development of the RD; additional wells may be required based on the final RD or even as the RA progresses, based on initial performance data.

d. *The DNAPL that is present will have high oxidant demands and could be potentially difficult to deplete. Additionally, there has been no direct quantification of the NOD of the sediments and how this may impact estimated and actual oxidant demand. Over or underestimating this number may impact the cost estimate if more or less oxidant is required. Please provide more information regarding how the amount of injectate was determined considering the contaminant distribution and lack of information regarding the NOD. Ohio EPA requests that this information is gathered during the FFS to better estimate costs.*

RESPONSE: As previously discussed, the potential presence of DNAPL was presumed based on conservative assumptions regarding the dissolved phase groundwater data. However, DNAPL was not observed or detected during the RI and therefore its presence has not been confirmed. As indicated in Appendix C-2 of the FFS, for cost estimating purposes, NOD was assumed at 1 gram per kilogram. This assumption is reasonable for sandy formations with relatively low organic content, although some sandy formations can have higher NOD. The majority of oxidant demand is typically exerted by soil. Only a small fraction of the oxidant is typically consumed by contaminants, including DNAPL. Nevertheless, if present, DNAPL mass would indirectly affect the quantity of oxidant consumed because DNAPL mass affects remedial duration. Treatment duration and cost may increase because of undiscovered DNAPL mass, and this may be unavoidable. However, DNAPL mass is almost impossible to estimate with certainty, and with the relatively low PCE concentrations observed on site (maximum concentration just above 2 percent PCE solubility) the cost of a DNAPL investigation may exceed the benefit. NOD testing will be completed, as well as any additional data gathering efforts needed to support the RD, as part of the pre-design studies. The cost estimate for ISCO will be refined after pre-design investigations, and if ISCO is not found to be the most cost-effective technology, it will be replaced by ISCR or ERD.

e. *The text mentions mobilization of heavy metals, such as chromium. This is a concern, especially in relation to the city of Troy's source water protection area and the ISCO treatment schedule. The text states that the chromium that may be mobilized should re-precipitate after exiting the treatment zone. The potential for this to occur should be investigated as a part of any treatability study.*

RESPONSE: The text will be revised to clarify that any treatability studies will consider and evaluate the applicable safety considerations for that technology, allowing the RD to appropriately address any concerns. Heavy metal mobilization will be investigated during the treatability study. Furthermore, treatment will commence in Zone A, the zone farthest upgradient from the source water protection area, and gradually proceed to areas further downgradient. This will allow adjustment of any operating parameters as needed to ensure protection of the wellfield.

f. *Specifics should be provided as to how the precipitation of manganese (di)oxide will be prevented/reduced, especially in Zone A as precipitation could restrict treatment of the DNAPL.*

RESPONSE: Manganese dioxide is an end product of permanganate redox reactions. Therefore, manganese dioxide precipitation cannot be avoided. The FFS will be modified to evaluate pore space occlusion due to manganese dioxide precipitation.

g. *Ohio EPA recommends that U.S. EPA consider the long-term effects of ISCO injections and the impact that ISCO injections will have on the aquifer chemistry and the microbes currently present. The aquifer may not be amenable to monitored natural attenuation (MNA) after ISCO is completed. This could impact the implementation of MNA as a long-term remedy, which has been discussed in previous documents. Please provide information or studies that support the implementation of MNA after ISCO. Alternatively, provide a brief discussion of other contingent/long-term remedies that may be implemented after ISCO.*

RESPONSE: ISCO only temporarily decreases the microbial population (Sahl et. al. 2007). However, even after re-establishment of the microbial population, biotic processes would not be a significant MNA mechanism at this site, because they are not a significant mechanism at present. As Ohio EPA has noted, there is little evidence of naturally occurring reductive dechlorination in this aquifer. Stimulating reductive dechlorination would require injection of an electron donor (organic carbon food source). Enhanced reductive dechlorination would degrade PCE, producing daughter products, albeit less efficiently because of the oxidized formation. However, producing daughter products after ISCO would negate any benefit of avoiding daughter product formation during ISCO. This paradox could be avoided if post-ISCO MNA were allowed to proceed without enhancement, and without a significant biotic component. Contaminant concentrations would still attenuate because clean groundwater upgradient of the source area would flush through, gradually depleting residual contamination.

Technology-Specific Comments - ERD/ISCR

17) *Additional support is necessary for the implementation of enhanced reductive dechlorination (ERD) and in-situ chemical reduction (ISCR) as information collected during the RI does not indicate that the aquifer would be amenable to reducing conditions. Consider the following: The RI Report and the draft FS concluded that there was little evidence that natural attenuation is occurring at a detectible rate at the site. Additionally, the aquifer currently shows little to no degradation of contaminants and biodegradation would likely need some enhancements.*

The degradation product, cis-1,2-dichloroethene (cDCE), has been detected in ground water at very low levels in the Residential Plume, and vinyl chloride (VC) has not been detected.

The first few Waterloo boring logs all indicated that the aquifer was aerobic and possessed inadequate conditions for biodegradation.

The RI examined MNA parameters and concluded that for the majority of parameters, there is limited, if any, degradation occurring, and the parameters do not support active dechlorination. The parameters present (nitrate, sulfate) may compete with the reductive pathway.

Additionally, the dissolved oxygen (DO) concentrations supported the aerobic state of the aquifer. The RI stated there is no evidence of active biodegradation/reductive dechlorination occurring in the Residential Plume area.

RESPONSE: This is expected in aquifers with low organic carbon content. Although the aquifer is currently inhospitable to dechlorinators, those microorganisms are present in the aquifer (as evinced by cDCE detection in some wells), and can be stimulated. Electron donors (organic carbon food source) would be injected to stimulate microbial growth. In addition, the aquifer would be inoculated with acclimated dechlorinating microorganisms. In essence, the remedy would produce the conditions necessary for microbial degradation of PCE and its daughter products, even if they do not exist at present. None of the geochemical data suggest that the aquifer would resist ERD. The text will be modified to include this summary.

18) *Recirculating of ground water for reduction technologies: Additional information should be provided about the recirculation and extraction proposed with the in- situ remedies to evaluate whether this would be effective considering the extent of the plume and the proximity to the wellfield's source water protection area. Sections 5.2.2, page 95, and 5.3.2, page 98 discuss that water from the downgradient end of Zones B, C and D would be used to recirculate through those Zones. Additional information should be provided that would support protection of receptors in these zones. The production of daughter products should also be considered.*

RESPONSE: Capture zone modeling would be conducted during the RD if the selected alternative includes recirculation. It is highly unlikely that recirculation would affect the wellfield's source water protection area. Conceptually, it is possible to maintain capture through design of well locations and injection and extraction rates. Vapor intrusion controls that are planned for individual properties would mitigate concerns regarding vapor intrusion of daughter products.

19) *Section 5.2.2, page 95, discusses the use of bioaugmentation with proprietary Dehalococcoides (DHC) microorganism cultures. Please clarify if the DHC bioaugmentation will be applied for both RGW-2 and RGW-3. While the text does not specifically mention it for RGW-3, the cost tables include it.*

RESPONSE: The text in Section 5.2.2 will be clarified to state that DHC would be used for both RGW-2 and RGW-3.

20) *Ohio EPA recommends that if a remedy with pumping or recirculation is chosen, scenarios be modeled to ensure protection of the wellfield's quality and quantity.*

Pumping from remediation wells is not anticipated to have a significant effect on the wellfield. The remedial design will include capture zone modeling.

21) *Section 5.2.3.1, page 98, states that the remedial design for Alternative RGW-3 would have to consider factors such as proximity to the city of Troy's wellfield. To ensure protection of the wellfield, this should be considered for all possible alternatives.*

RESPONSE: The text describing each individual alternative will be modified to state that the proximity to the City of Troy's wellfield will be considered in the RD and that the RD will consider measures to mitigate any concerns potentially arising from implementing the remedial action.

22) *Section 6.3.2.1, page 118 discusses possible generation of chlorinated daughter products and states that corrective measures could be implemented if daughter products are generated. Please provide examples of corrective measures and what may be done if daughter products are generated.*

RESPONSE: The potential formation of daughter products will be considered in the RD and potential countermeasures will be identified at that time; however, a brief discussion of potential corrective measures will added to Section 6.3.2.1. Ongoing monitoring will be conducted as the IA progresses gradually, from Zone A toward Zone D. One possible example of a corrective measure would be to place a permeable reactive barrier at the downgradient end of the plume to remove or reduce daughter product concentrations. Several technologies could be employed for this purpose, including abiotic dechlorination (via pure zero-valent iron (ZVI) or ZVI-containing products), air sparging, and chemical oxidation (ozone-peroxide with emission control).

23) *Section 6.3.2.6, page 121, does not state if the technical feasibility of ERD would be difficult, as it does in Section 6.3.3.6 for ISCR. It seems that the level of difficultly would be the same, as the technical concerns are almost identical. Please provide further information on the technical feasibility of ERD.*

RESPONSE: The discussion of the technical feasibility of ERD will be modified to reflect the level of difficulty of implementation.

Pathway-Specific Comments – Vapor Intrusion

24) *Ohio EPA is concerned about the extent of the proposed preemptive vapor intrusion mitigation area. The extent of potential vapor intrusion impacts was not delineated in the RI. This issue is also discussed in Comment 46(b) of Ohio EPA's August 21, 2015 comment letter on the FS. In particular, Ohio EPA is concerned about the buildings north of Main Street, across from the suspected source area beneath the First Presbyterian Church. These buildings are within 100 feet of the highest VOC concentrations in ground water that will undergo treatment. In addition, Ohio EPA is concerned about the extent of the preemptive mitigation area in the downgradient direction. For example, the 100 µg/L VOC plume line (although not a vapor intrusion action level, this line provides a useful point of reference) extends to Frank Street, a block beyond the end of the mitigation area along Counts Street. Ohio EPA requests that the preemptive area be extended to include these additional structures.*

RESPONSE: The proposed area of preemptive mitigation will be expanded, as requested by Ohio EPA. The area will include the entire "upgradient" groundwater exposure area. This area encompasses all structures within the known area of the plume on its upgradient and lateral boundaries, and the area with total VOC concentrations >100 µg/L on the downgradient end (approximately at Frank Street). The area also encompasses the entire proposed groundwater treatment area as well as buffer zones on the lateral edges and a three-block (approximately 200 yard) buffer zone on the downgradient end. As discussed during the April 3 conference call with EPA and Ohio EPA, the buildings on the north side of East Main Street (between Walnut Street and Mulberry Street) will be included in the preemptive mitigation area. Figure 5-7 will be revised to reflect the expanded area and the cost estimates for Alternative VI-2 will be revised to include the additional structures.

25) *It is critical that the preemptive mitigation area be appropriately identified, as ground water treatment may temporarily worsen the vapor intrusion pathway. To aid in understanding the potentially affected structures, Ohio EPA requests that figures be generated for individual VOC depicting ground water plume contours to the vapor intrusion screening level (VISL).*

RESPONSE: FFS figures depicting the preemptive area VI area will be revised to reflect the increased buffer zones on the downgradient end and the additional buildings north of East Main Street, described above in the response to Comment 24. The proposed VI mitigation area is not based on VISL values. Detailed information regarding plume boundaries may be found on the existing site figures. The draft FFS currently includes figures depicting the general groundwater concentrations of PCE, TCE, and cDCE (Figures 1-11A, B, and C), and figures depicting the overall plume boundaries relative to the proposed preemptive area (Figure 5-7). It should also be noted that the plume contours on Figure 5-7 are conservatively based on the highest concentrations of VOCs detected, regardless of depth. Based on these considerations, figures showing VOCs relative to VISLs do not appear to be necessary at this time.

26) *The proposed ground water treatment technologies may worsen ground water concentrations, generate daughter products, and move the ground water plume. Increased concentrations, daughter products, and migrating plumes may expand beyond the vapor intrusion preemptive mitigation area. Please provide a discussion on the possible effects that ground water treatment may have on the area of vapor intrusion concern and additional measures that may be taken to further mitigate vapor intrusion.*

RESPONSE: The following statement will be added to the text in Section 5.3.2: "The proposed mitigation area encompasses the entire proposed groundwater treatment area as well as buffer zones on the lateral edges and a three-block (approximately 200 yard) buffer zone on the downgradient end. Based on these considerations, the proposed groundwater treatment activity is not anticipated to exacerbate VI concerns in areas beyond the proposed VI mitigation zone. In addition, the potential to form degradation products will somewhat depend on which technology is implemented; for example using ISCO, daughter product formation is less likely. Overall, regardless of the technology implemented, commencing treatment in Zone A and evaluating performance, as well as monitoring for daughter products and potential changes in VOC concentrations in the treatment zones and key lateral downgradient locations as treatment progresses, would provide ample warning should the treatment temporarily exacerbate conditions in areas currently outside the proposed VI mitigation area."

27) *Vapor Intrusion Institutional Controls: Section 5.3.2 Soil Vapor Alternative VI-2, page 102, discusses using institutional controls to restrict land use or require vapor mitigation systems in the form of restrictive covenants, zoning prohibitions, and advisories. Please provide information on how these institutional controls would be implemented and monitored and the criteria that would be used to determine the use of an institutional control on vacant*

land. Additionally, the text states that these institutional controls "may be" implemented – please clarify whether or not institutional controls are being proposed as a component of the vapor intrusion pathway interim remedy.

RESPONSE: As discussed during the April 5 AA review, ICs will not be a component of the VI alternatives. All references to ICs in this context will be removed from the draft FFS.

28) *Section 2.3.3, page 55, discusses that vapor mitigation is proposed at all occupied structures above the ground water treatment areas and in a downgradient buffer zone. However, the text cites this work as necessary due to a lack of access from previous sampling attempts. If U.S. EPA has been denied access for sampling in the past, it is likely they will be denied access for the installation of mitigation systems. Therefore, it is not clear how the vapor intrusion RAO will be addressed. Similarly, Section 5.2.2.1, page 97, states that structures over the ground water injection zones will be offered an SSDS and that this will ensure that the generation of dechlorination byproducts will not result in vapor intrusion concerns. More information and contingencies are needed for how receptors will be protected if access to install an SSDS is not granted.*

RESPONSE: Sun-slab depressurization systems (SSDSs) are not considered a permanent solution for VI concerns at the site; this can only be achieved by addressing the high groundwater concentrations of VOCs. EPA will offer an SSDS to property owners of all structures within the proposed VI mitigation area who will accept it to reduce VI risk in the interim until groundwater contaminant concentrations are reduced to safe levels. Public outreach will be conducted in advance and multiple attempts will be made to encourage participation and ensure that all property owners are contacted and made aware of why the systems are being offered, the potential health risks associated with the plume and groundwater treatment, and the estimated timeframes for which operation of the systems will be required. The property owners will also be informed of the details regarding how the system would be installed and maintained. Outreach support from state and local resources is anticipated to enhance participation. Based on these considerations, individual property owners may make an informed decision as to whether to accept a system.

29) *Section 4.3.5.1, page 88, states that, "For the ETCA site, the ground water plumes underlie numerous privately owned properties. Therefore, effective SVE systems would be difficult to implement." This is used as the basis for not retaining SVE as an option for containment of soil vapor to mitigate soil vapor intrusion. It is not clear why a system could not be installed in right of ways near structures where access for indoor air sampling or mitigation systems are denied. Given the implication in Section 2.3.2 that U.S. EPA will likely be denied access to install mitigation systems in a number of structures, Ohio EPA believes this alternative should be retained for consideration.*

RESPONSE: During the conference calls on April 3 and 5, 2017, the potential for including exterior SVE systems in public right-of-ways was discussed. Issues with implementability, effectiveness, and the ability of systems in the public right-of-ways to mitigate vapor intrusion in nearby structures were identified. EPA will make reasonable efforts to encourage property owners to accept an SSDS. Owners who choose to not accept an SSDS will likely be present at widespread locations throughout the area. This would require installation and operation of multiple exterior systems and make SVE impractical or cost prohibitive. SVE wells located in the right of way may not provide effective protection within structures located away from the street. In addition, the proposed groundwater remediation will present logistical challenges with regard to working around area utilities and private property; thus the additional construction activities required for exterior SVE systems would significantly exacerbate the challenges to implementing the ultimate solution to the VI issue (addressing the groundwater plume). Section 3 of the FFS will be revised to provide more detail as to why this option was not retained and carried forward.

30) *Section 5.3.2.3, page 103, states that older structures may have dirt basement floors requiring installation of a plastic membrane to ensure that an SSDS can function. It is unclear how many homes are estimated to have dirt floor basements (for example, based on previous sampling efforts) or how these situations might affect the cost estimates for the vapor intrusion remedy. Please provide further discussion on the likelihood of encountering dirt floor basements and how that will affect the cost estimate.*

RESPONSE: The number of structures without a slab can be reasonably estimated based on the locations where such conditions were encountered during the RI and the 2006-2007 time critical removal action (TCRA). Locations where only indoor air samples were collected (no sub-slab samples) provide a conservative estimate of structures with dirt basement floors, and include some locations that lacked basements altogether or locations where owners possibly did not allow sub-slab samples to be collected. Based on these considerations, 9 out of 110 total locations tested, or roughly 8 percent of the locations, had no slabs. For this reason, 8 percent of the proposed SSDS locations will be assumed to have basements with dirt floors. The text will be revised to reflect this, and costs will be revised accordingly. It should be noted that the number does not significantly affect the overall cost estimates given the target range of -30 to +50 percent.

Pathway-Specific Comments – Soil Remediation

31) *According to the RI and the FFS (Section 5.1.2.2, page 92) contamination may be located below the Hobart and Spinnaker buildings. Please provide a discussion of whether or not this contamination may pose a threat to ground water cleanup and potential vapor intrusion threats. Is there a plan to revisit these areas during the FS?*

RESPONSE: Contamination beneath these structures, where present, is anticipated to be primarily related to the groundwater plumes. The IA is intended to address exterior soils that appear to be sources of groundwater contamination at these properties. The FFS addresses only the IA. As stated in Section 1, a final FS that addresses site-wide risks and a permanent ROD will be completed at a future date. The need to address specific areas at the site that were not addressed by the IA will be evaluated and determined at that time and will consider the effectiveness of the IA in reducing groundwater contamination as well as site risks identified in the HHRA.

32) *In Appendix C, the cost estimate for soils Alternative S-2 gives the same volumes of excavated soil and backfill. Normally, compaction during backfilling will increase the amount of backfill, requiring a larger volume than what was excavated. Please consider revisiting this estimation.*

RESPONSE: The soil volumes will be revised as appropriate to reflect appropriate bulking factor (for loading, hauling and disposal and disposal) and compaction (for backfill) assumptions. Costs will also be revised accordingly. The bulking factors will reflect the soil types known to be present in the proposed excavation areas based on the borings completed and logged in these areas during the RI.

Appendix C – General Comment

33) *Appendix C cost estimates for the alternatives provide a 30% "contingency." The cost estimates at the detailed analysis stage should provide an accuracy of +50% to -30%. It is unclear what is meant by the 30% contingency. Please provide a rational for its use.*

RESPONSE: The 30 percent contingency is separate from the "-30 to +50 percent" targeted accuracy of the estimate. A 30 percent contingency is common for FS cost estimates because the FS represents early stages of remedy development. Bid and scope contingencies make up the total contingency. EPA recommends 10 to 20 percent bid contingency and 10 to 25 percent scope contingency (OSWER 9355.0-75). The 30 percent contingency represents the combination of the two.

REFERENCES

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SulTRAC. 2015. Remedial Investigation and Risk Assessment Report for the East Troy Contaminated Aquifer Site; Troy, Miami County, Ohio. January 9.